

Vision Document

Caffeine Coders | 2 July 2024

Fueling innovation, one cup at a time!

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Introduction

Trivial Compute is an innovative educational game designed to revolutionize the way computer science concepts are learned, making the process engaging and interactive. This multiplayer trivia game challenges players to navigate a dynamic game board, answering questions related to various computer science topics. By creating a fun and competitive environment, Trivial Compute aims to deepen players' understanding of key computing principles while keeping them motivated and entertained.

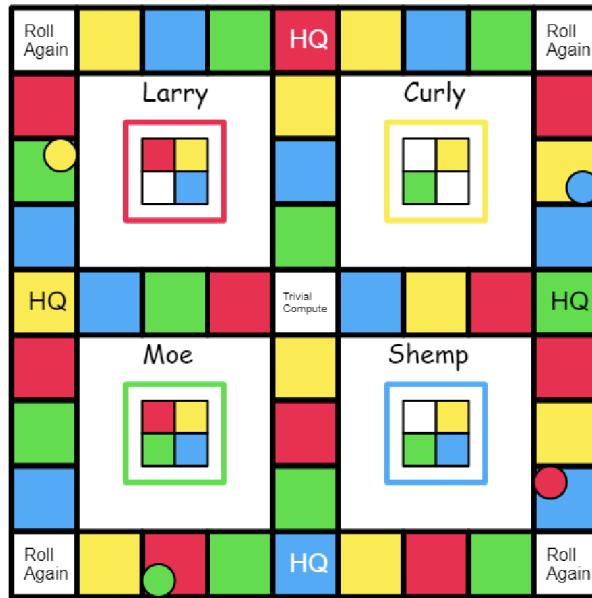


Figure 1: Trivial Compute Game Board

Purpose

The Vision Document for Trivial Compute outlines the stakeholders' perspectives on the product to be developed. It articulates their key goals, needs, and desired features, serving as a foundation for understanding and addressing their expectations. This document provides a framework for eliciting and specifying detailed product requirements, ensuring that the final software aligns with the stakeholders' vision and delivers an engaging, effective learning experience. Additionally, it will guide the development process, helping the team stay focused on the core objectives throughout the project lifecycle.

Scope

The scope of Trivial Compute encompasses several key objectives:

1. Game Development:

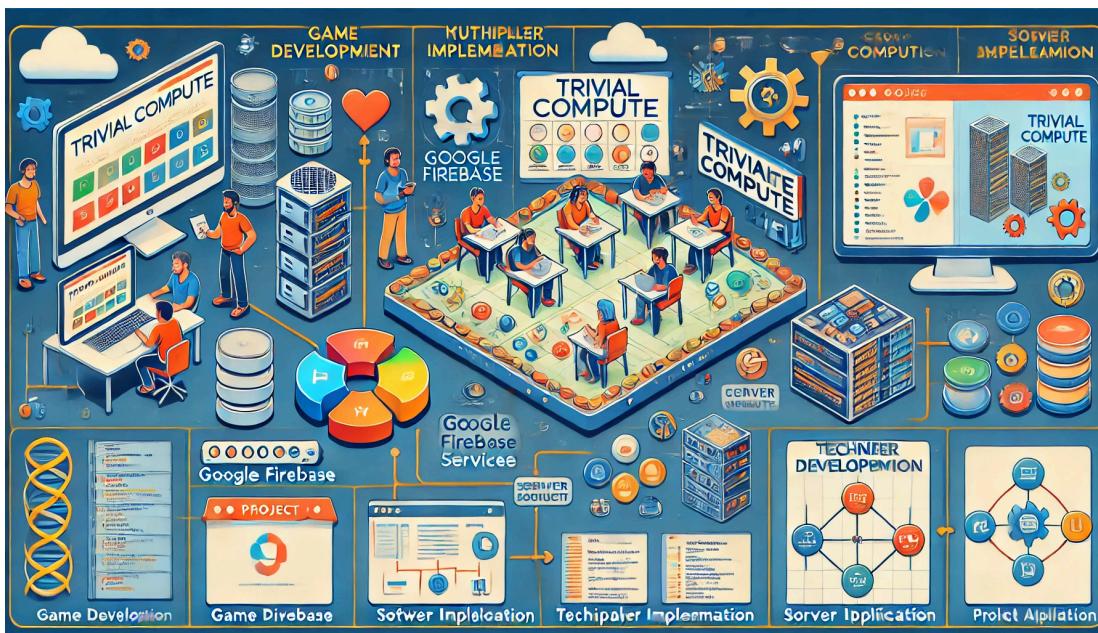
- Design and implement a multiplayer trivia game focused on computer science concepts.
- Create an intuitive and visually appealing game board interface.
- Develop a robust question-and-answer system covering various CS topics.

2. Technical Implementation:

- Utilize Google Firebase for backend services, including real-time database and authentication.
- Implement a server-side application to manage game logic and player interactions.
- Package the application using containerization technology for easy deployment and scalability.

3. Project Management:

- Design and document requirements to ensure clarity and alignment with stakeholders' goals.
- Employ an iterative development approach, releasing software increments for continuous improvement based on feedback.
- Foster collaboration through sharing program documentation with classmates via the class discussion board.



Definitions, Acronyms & Abbreviations

API (Application Programming Interface): A set of protocols, routines, and tools for building software applications, defining how software components should interact.

Containers: Containers are a form of lightweight virtualization that allows applications to be packaged together with their dependencies and configurations. They provide a consistent environment for applications to run across different computing environments, such as development, testing, and production. Containers are portable, scalable, and efficient, making it easier to deploy and manage applications across cloud platforms and on-premises infrastructure. Popular containerization platforms include Docker and Kubernetes, which facilitate the orchestration and management of containerized applications.

Docker: An open-source platform used to develop, ship, and run applications inside containers.

Google Firebase: Google Firebase is a platform developed by Google that provides a suite of tools and services for building mobile and web applications. It offers features such as real-time databases, authentication, cloud storage, hosting, and analytics, all managed through a unified console. Firebase aims to streamline app development by offering robust backend infrastructure and eliminating the need for managing servers and infrastructure manually.

GUI (Graphical User Interface): The visual interface through which users interact with the Trivial Compute game.

Server: A server refers to a computer or a software system that provides functionality or resources to other computers, known as clients, over a network. Servers can serve various purposes, such as hosting websites, storing and managing data, processing requests from clients, or running applications that handle computations or perform specific tasks.

Positioning

Business Opportunity

Trivial Compute offers a significant business opportunity within the rapidly growing educational technology (EdTech) sector, driven by technological advancements and increasing educational demands:

- **Growing EdTech Market:** The EdTech sector is experiencing unprecedented growth and investment. According to a McKinsey & Company report, global venture capital investments in EdTech reached \$20.8 billion in 2021, a dramatic increase from a decade ago. This surge in investment reflects broader trends of rapid technological change, digital transformation across industries, and increased broadband accessibility. These factors contribute to a growing demand for innovative educational tools, particularly in STEM education, positioning Trivial Compute to capture a share of this expanding market.
- **Gamification of Learning:** The gamification of education is a rapidly growing trend. Global Market Insights projects that the global Gamification in Education market, valued at US\$2.2 billion in 2022, will reach US\$14.3 billion by 2030, growing at a CAGR of 26.3% over 2022-2030. Trivial Compute capitalizes on this trend by integrating trivia with game mechanics, addressing the need for engaging educational methods that motivate and educate users effectively.
- **Potential for Institutional Adoption:** Trivial Compute presents a significant opportunity for institutional adoption. Universities and coding boot camps can integrate the game into their curricula as a supplementary learning tool, enhancing traditional educational methods and providing students with an interactive platform to reinforce their learning.
- **Scalable Platform:** The web-based architecture of Trivial Compute ensures easy updates and scalability. This flexibility not only allows for continuous improvement of the computer science content but also opens the possibility of expanding into other educational subjects, thereby increasing its utility and potential user base.

Problem Statement

Many educational games today fail to fully engage students or accommodate diverse learning styles and paces. These limitations often result in:

- 1. Lack of sustained student interest**
- 2. Ineffective learning outcomes**
- 3. Inability to adapt to individual student needs**

Trivial Compute aims to address these challenges by offering an educational game that is both entertaining and adaptive, designed to enhance the learning experience for a wide range of students.

Product Position Statement

For students and educators seeking more engaging and effective learning tools, Trivial Compute is an educational game that:

- 1. Combines trivia challenges with personalized learning experiences**
- 2. Adapts to individual learning paces and preferences**
- 3. Provides an enjoyable and effective learning environment**

Unlike traditional educational software that often struggles to maintain student engagement, Trivial Compute offers a dynamic approach to learning computer science concepts. By focusing on user engagement and adaptability, Trivial Compute is an innovative solution in the educational technology landscape, suitable for various educational settings and needs.

Stakeholder & User Descriptions

Stakeholder Summary

Developers - Caffeine Coders Members: These stakeholders are responsible for creating, planning, and documentation of the software for Trivial Compute. Their expertise ensures the development of a robust and user-friendly platform, supporting both students and teachers in the learning process.



Educational Institutions: These stakeholders include schools, daycares, and online courses that may adopt Trivial Compute as part of their curriculum. They are responsible for integrating the game into their educational programs and supporting teachers and students in effectively using the program.



Elementary and High School Students: These stakeholders are elementary and high school students seeking innovative learning techniques. They engage with the game board, answering questions during their turns to enhance their understanding and retention of educational material.



Elementary and High School Teachers: These stakeholders are responsible for creating questions that serve as a quiz mechanism for their students. By integrating this interactive approach, teachers can facilitate a more engaging and effective learning experience.



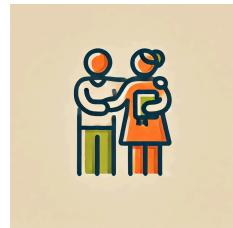
Potential Enterprises: These stakeholders include EdTech companies, corporate training departments, and educational publishers. They may be interested in partnering with, acquiring, or integrating Trivial Compute into their existing products or services to enhance their educational offerings.



Regulators: These stakeholders include educational boards, accreditation bodies, data protection authorities, and accessibility regulators. They ensure that Trivial Compute meets required educational standards, complies with data protection laws, and provides accessible user features.



Parents and Guardians: These stakeholders are crucial in supporting their children's education. They may influence the adoption of educational tools like Trivial Compute in schools or use it for supplementary learning at home.



Educational Researchers: These stakeholders are academics and researchers in education. They may be interested in studying the effectiveness of Trivial Compute as an educational tool and its impact on learning outcomes in computer science education.



User Summary

There are two groups of direct users for Trivial Compute. These groups are also stakeholders.

- **Elementary and High School Students:** See section above.
- **Elementary and High School Teachers:** See section above.

User Environment

Below are the user environments for Trivial Compute, an online learning game:

1. **Elementary and High School Online Virtual Classrooms:** Integrated within virtual classrooms, Trivial Compute enhances engagement through interactive learning experiences, supporting educators in diverse educational settings.
2. **Internet Browsers:** Accessible via standard web browsers, Trivial Compute offers flexibility and convenience for students to participate in educational quizzes and activities from any internet-enabled device.
3. **Mobile Devices:** Optimized for mobile use, enabling students to engage with learning content on smartphones and tablets, ensuring accessibility anytime, anywhere.
4. **Desktop Computers:** Designed for seamless performance on desktops, providing a robust learning platform with rich multimedia content and interactive features.
5. **Interactive Whiteboards:** Compatible with interactive whiteboards in classrooms, facilitating collaborative learning and real-time engagement during lessons.

Stakeholder (Non-User) Profiles

Developers - Caffeine Coders Members

- Role:
 - Create, plan, and document Trivial Compute.
- Responsibilities:
 - Develop and validate the software program.
 - Ensure product is robust and user-friendly.
 - Implement features based on evolving requirements.
 - Timely delivery of software increments.
 - Ascertain clear and effective requirements.
- Characteristics:
 - Professionals with backgrounds in computer science and software development.
 - Proficient in programming, database management, and UI design.
 - Collaborative and focused on continuous improvement.
- Environment:
 - Remote collaborations utilizing project management tools and asynchronous meetings.



Educational Institutions

- Role:
 - Evaluate Trivial Compute efficacy.
 - Integrate Trivial Compute into their educational programs.
- Responsibilities:
 - Adopt and support use of Trivial Compute in their curriculum.
 - Provide training for teachers to effectively use the game.
 - Monitor educational impact of the program.
- Characteristics:
 - Schools, daycares, online courses, libraries, and other educational platforms.
 - Administrators and educators with varying levels of experience in educational technology.
 - Open to innovative teaching methods to improve student learning.



Potential Enterprises

- Role:
 - Explore partnership, acquisition, or integration opportunities with Trivial Compute.
- Responsibilities:
 - Evaluate Trivial Compute for potential business synergies.
 - Integrate Trivial Compute into existing product lines or services.
 - Provide resources for scaling and improving Trivial Compute.
- Characteristics:
 - EdTech companies, corporate training departments, and educational publishers.
 - Innovation-driven with a focus on enhancing educational offerings.
 - Have established market presence and distribution channels.
- Environment:
 - Competitive EdTech market with rapidly evolving technologies.
 - Increasing demand for engaging and effective educational tools.



Regulators

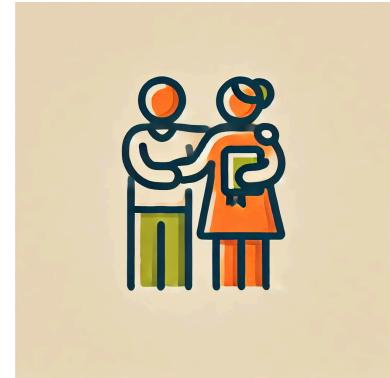
- Role:
 - Oversee compliance and standards for educational technology.
- Responsibilities:
 - Ensure Trivial Compute meets educational standards and curriculum requirements.
 - Verify compliance with data protection laws (e.g., GDPR, COPPA).
 - Assess accessibility features for users with disabilities.
- Characteristics:
 - Educational boards, accreditation bodies, data protection authorities, and accessibility regulators.
 - Rigorous in enforcing standards and regulations.
 - Focused on protecting student interests and ensuring quality education.
- Environment:
 - Evolving regulatory landscape in response to technological advancements in education.



- Increasing emphasis on data privacy and accessibility in educational technology.

Parents and Guardians

- Role:
 - Support and guide their children's educational journey.
- Responsibilities:
 - Evaluate and potentially advocate for the adoption of Trivial Compute in schools.
 - Decide on using Trivial Compute for supplementary learning at home.
 - Provide feedback on their children's experience with the game.
- Characteristics:
 - Diverse backgrounds with varying levels of technological literacy.
 - Invested in their children's educational success.
 - Seeking effective and engaging learning tools.
- Environment:
 - Increasing involvement in children's education, particularly with remote learning trends.
 - Growing awareness of the importance of technological literacy for future success.



Educational Researchers

- Role:
 - Study the effectiveness and impact of Trivial Compute in computer science education.
- Responsibilities:
 - Design and conduct studies on Trivial Compute's impact on learning outcomes.
 - Analyze data on student engagement and performance.
 - Publish findings to contribute to educational technology research.
 - Provide recommendations for improvements and best practices.
- Characteristics:
 - Academics and researchers specializing in education and educational technology.
 - Analytical and detail-oriented with a focus on empirical evidence.



- Interested in innovative approaches to teaching and learning.
- Environment:
 - Academic settings with access to research resources and methodologies.
 - Collaborative networks with other researchers and educational institutions.
 - Pressure to publish and contribute to the field of educational technology.

User Profiles

Elementary and High School Students

- Role:
 - Engage with Trivial Compute by answering trivia and learning.
- Responsibilities:
 - Participate in trivia games.
 - Play and answer questions during their turns.
 - Use the program to enhance understanding of educational material.
- Characteristics:
 - Aged 6+ with varying educational backgrounds.
 - Basic to intermediate computer skills with familiarity in computer web browsers and apps.
 - Motivated by gamification and competition with peers.
 - Desire to learn at varied speeds and difficulty.



Elementary and High School Teachers

- Role:
 - Create trivia questions and facilitate student learning.
 - Incorporate Trivial Compute into their educational planning.
- Responsibilities:
 - Develop and customize trivia questions to match needs.
 - Monitor student progress and engagement.
- Characteristics:
 - Educators teaching elementary to high school students with varying levels of teaching experience.
 - Proficient in educational technology and open to learning methods of customizing educational content.



- Interested in interactive and collaborative learning tools for students.

Key Stakeholder Goals/Needs

- **Developers - Caffeine Coders Members:** Develop the project with a focus on technical robustness and user-friendliness in a timely manner.
- **Elementary and High School Students:** Engage with the project through interactive and adaptive learning experiences.
- **Elementary and High School Teachers:** Integrate and utilize effective tools for customizable and collaborative educational content.
- **Educational Institutions:** Assess Trivial Compute and support educators with the adoption of the program.
- **Potential Enterprises:** Enhance their educational offerings through partnership or integration with Trivial Compute.
- **Regulators:** Ensure Trivial Compute meets educational standards, data protection laws, and accessibility requirements.
- **Parents and Guardians:** Support their children's education with engaging and effective supplementary learning tools.
- **Educational Researchers:** Study the effectiveness and impact of Trivial Compute on computer science education outcomes.

User Goals/Needs

Elementary and High School Students:

- Interactive Learning Experience
 - Goal - Learn in an interactive and engaging manner.
 - Need - Trivia questions with instant answer feedback to facilitate learning.
Gamification elements to promote interaction and motivation.
- Adaptive Learning
 - Goal - Dynamic range of Questions
 - Need - Custom Trivia question set or difficulty adjustment based on user settings.
- Accessibility
 - Goal - Ability to engage with the game from multiple platforms depending on availability..
 - Need - Game compatibility with a large range of platforms.
- Collaboration
 - Goal - Learn by engaging with peers.
 - Need - The Game must support multiple players.

Elementary and High School Teachers

- Effective and Customizable Teaching Tool
 - Goal - Facilitate student learning with tools that can enhance teaching methods.
 - Need - Trivia games must have customization options for questions to tailor content.
- Convenient Teaching Tool
 - Goal - Straightforward platform to facilitate learning.
 - Need - Intuitive user interface for customizing question content.
- Share and Reuse Content
 - Goal - Collaborate on resources with other educators.
 - Need - Game contents stored on database and accessible with a shared account.

Product Overview

Description:

Trivial Compute is an interactive educational game designed to enhance learning through trivia challenges and collaboration using a web based game board.

Vision Statement

Our vision is to transform traditional learning by creating an education experience that is fun, accessible online, and maximizes social learning.

Benefits and Value Proposition

Trivial Compute offers a unique value proposition by transforming the way material is taught and learned through an engaging, interactive, and adaptive game. Unlike traditional educational tools, Trivial Compute captivates students' interest with its dynamic game board and competitive multiplayer environment, making learning both fun and motivating. The game's comprehensive coverage, combined with immediate feedback and reinforcement, ensures effective learning outcomes. Additionally, its adaptive features cater to individual student needs, providing personalized learning paths and adjustable difficulty levels that accommodate different learning styles and paces. By integrating entertainment with education, Trivial Compute not only enhances students' understanding of key computing principles but also fosters a sustained interest in the subject, making it an invaluable resource for educators and learners alike.

Competitive Analysis

Trivial Compute's competitive advantage lies in its ability to provide an engaging, effective, and adaptive learning experience that is flexible and accessible, making it a superior choice compared to traditional educational methods and other educational games.

Product Features

Trivia Pursuit Game

- **Start/End Game** - Users can begin or end rounds of the game.
- **Select Number of Players** - Users can decide the number of human players 1-4.
- **Moving Game Pieces** - Functional game pieces move corresponding to the game logic.
- **Score Keeping** - Track and display the current score of all players.
- **Interactive Dice Roll** - Users can roll simulated dice to initiate turn.
- **Customizable Difficulty** - Question bank difficulty can be selected at the start of the game.

Content Creation Features

- **Account Login** - Users can login to access the question database.
- **UI Form for Creating Trivia** - Easy to use form for generating new content.
- **Online Database Storage** - Google Firebase for storing created content.

System Features

- **Accept mouse/touch action inputs**
- **Accept keyboard inputs**
- **Containerized program**

Constraints

Time Constraints

- **Development Timeline:** Strict development timeline to ensure timely delivery. Delays could impact the overall schedule and result in feature reduction.
- **Testing and Iteration:** Adequate time must be allocated for thorough testing to meet quality standards.
- **Academic Calendar Alignment:** Development and release must align with academic calendars for effective implementation in educational settings.

Technical Constraints

- **Multiplatform Performance:** Program must run efficiently on various devices and browsers.
- **Scalability:** Database and server infrastructure must be scalable to accommodate a growing number of users.
- **Program Functionality:** All features must work as expected across different platforms and user scenarios.
- **Internet Dependency:** The game must function reliably with varying internet connection qualities.

Legal Compliance Constraints

- **Copyright Laws:** Program must comply with copyright laws concerning the use of "Trivial Pursuit" and associated game mechanics.
- **Data Protection:** Must adhere to data protection regulations (e.g., GDPR, COPPA) for handling student information.
- **Accessibility Standards:** Must meet accessibility guidelines to ensure usability for students with disabilities.

Performance and User Experience Constraints

- **Response Times:** Trivial Compute must have fast response times for a smooth user experience.
- **Engagement:** The game must be engaging and fun to motivate student utilization.
- **Usability:** The user interface must be intuitive and easy for users of all technical levels to interact with.
- **Content Quality:** Trivia questions and educational content must be accurate, relevant, and aligned with curriculum standards.

Resource Constraints

- **Budget:** Development and maintenance costs must stay within the allocated budget.
- **Team Size:** The project must be completed with the current team size without additional hiring.

Integration Constraints

- **Educational System Compatibility:** Must be compatible with common Learning Management Systems (LMS) used in schools.
- **API Limitations:** Must work within the constraints of third-party APIs and services (e.g., Firebase) being utilized.

Maintenance and Support Constraints

- **Long-term Viability:** The system must be designed for easy maintenance and updates over an extended period.
- **Support Resources:** Limited resources available for user support and troubleshooting post-launch.

Lessons Learned

1. We leveraged generative AI to design the majority of the graphics in our vision document. By inputting detailed descriptions of our users and stakeholders into the language model, we generated relevant and accurate images.
2. For some of the paragraphs, we used ChatGPT AI to assist with proofreading and sentence enhancement. For example, we would draft a paragraph that needed improvement and then prompt ChatGPT to "make this sentence sound better for an educational audience." Most of the time, the result was significantly improved.
3. One key lesson we've learned is that while generative AI is powerful, it's not flawless. To achieve optimal outcomes, we found it most effective for enhancing sentences rather than generating entirely new content. This approach mitigates potential errors, as language models can occasionally generate inaccurate results due to hallucinations or other factors.

Credits List

Casey - Introductions sections, Product overview, identifies initial stakeholders

Ting-Wei Wang - Positioning, identifying stakeholders

Calvin - Performed work on features and stakeholder sections

Justin - Outline, identify initial stakeholders